

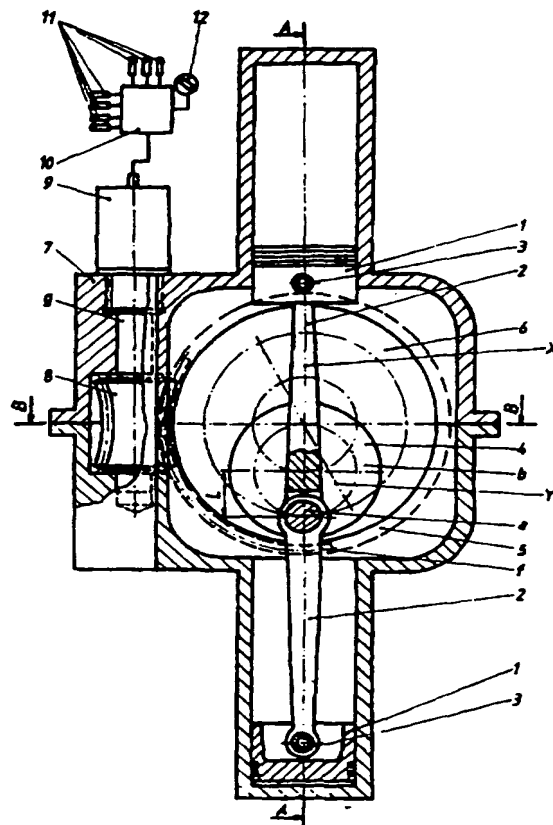
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>F01B 9/02, F02B 75/32, F16H 25/16</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 97/16625</b> <b>(43) International Publication Date:</b> 9 May 1997 (09.05.97)
<b>(21) International Application Number:</b> PCT/RO96/00002 <b>(22) International Filing Date:</b> 18 January 1996 (18.01.96)  <b>(30) Priority Data:</b> 95-01911 2 November 1995 (02.11.95) RO  <b>(71)(72) Applicant and Inventor:</b> GIURCĂ, Liviu, Grigorian [RO/RO]; Str. Valea Rosie, Bl. C7, Sc. 1, ap.26, Jud. Dol J, R-1100 Craiova (RO).	<b>(81) Designated States:</b> European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>	

**(54) Title:** ADAPTIVE MOTOR MECHANISM**(57) Abstract**

The present invention relates to an adaptive motor mechanism which achieves the transformation of the alternative motion of translation in rotation motion and conversely, concomitantly with the continuous adjustment of the stroke. This mechanism has two pistons (1) which drive, using two connecting rods (3), a crank shaft (4) which turns inside a main shaft (6). The crank shaft (6) includes a satellite (c) which engages with an interior geared plate (5), considered fixed for the same adjustment. The interior geared plate (5) has to the external side a geared segment (f) engaging with a worm (8) which can change the radial position of the interior geared plate (5) and therefore the stroke of the pistons (1). This mechanism can be used for thermic and hydraulic machines or for any mechanical structure having need of variable stroke.



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## ADAPTIVE MOTOR MECHANISM

## TECHNICAL FIELD

5 The present invention relates to an adaptiv motor mechanism which achieves the transformation of the alternative motion of translation in rotation motion and conversely, concomitantly with the continuous adjustment of th stroke. This mechanism is useful for thermic and hydraulic machines, for machine tools and for other structure.

10

## BACKGROUND ART

The most used mechanism for thermic and hydraulic machines is that one with connecting rod and crankshaft. 15 Although it is a simple mechanism, it has many disadvantages. It produces a considerable pressing force between piston and cylinder which has negative effects as to th durability. It has a fixed stroke of the piston and that means for the engines a fixed compression ratio and a 20 great dependence on the fuel sort. The fixed compression ratio has a negative effect as to the super-charging process becose is necessary to reduce the air pression for certain conditions. The diesel engines have a great compression ratio fixed for starting conditions but that is 25 not adequate for the fuel economy and for the size of th engines. For gasoline engines the fixed compression ratio has a negative influence as to the volumetrical efficiency for little and partial load. With this mechanism is very difficult to achieve a working interruption for certain 30 cylinders to the little and partial load while other cylinders work on.

For the hydraulic pumps which use this mechanism, the fixed stroke means an invariable flow.

## 35 OBJECT OF THE INVENTION

It is therfore an object of the present invention to

provide such a continuous variable stroke of the piston is operated most efficiently in the thermic and hydraulic machines.

## 5 DISCLOSURE OF THE INVENTION

This object is attained according to the instant invention in a adaptiv motor mechanism having, in a first instance, at least one piston jointed with a connecting  
10 rod which transmits its alternative motion of translation to a crank pin. In the second instance at least on piston, in solidarity with a push rod, transmits its alternative motion of translation to a crank pin, using a slide which can oscilate inside a guide. The crank pin  
15 belongs to a crank shaft which contains too a crank and a satellite which engages with an interior geared plate, considered fixed for the same adjustment, the crank and the satellite having a planetary motion inside a main shaft which turns inside a crankcase. The radial position  
20 of the interior geared plate can be changed using a geared sector, situated at the external side of the interior geared plate, this geared segment engaging with a worm. The worm is driven, in a first variant, by a step-by-step motor or, in a second variant, by an actuator which is  
25 controled by an electronic unit receiving informations from certain specific sensors and from a selector switch which transmits the option of the user. The variation of a radial position of the interior geared plate brings about the change of the piston's stroke. For the good working of  
30 this mechanism is necessary that the distance between the rotation axis of the crank and the axis of the crank pin to be equal to the pitch radius of the satellite and equal to the half pitch radius of the interior geared plate.

## 35 ADVANTAGEOUS EFFECTS

Th adaptiv motor mechanism, according to th present

invention offers certain advantages. To the maximum stroke position the force between piston and cylinder is zero and in other positions is much diminished. This mechanism can achieve a continuous variation of the stroke and that means the continuous variation of the compression ratio and certainly of the capacity. That means for engines a very good adaption of the combustion parameters to the necessities and means too a maximalize of the effective efficiency. Other consequence is that one as the same engine can use many types of fuel. This mechanism can achieve a stroke equal with zero and that means for engines the possibility of the working interruption for certain cylinders to the little and partial load while other cylinders work on.

The variable capacity means for hydraulic machines a variable flow.

#### BRIEF DESCRIPTION OF THE DRAWINGS

20

Fig.1 is an axial section through the adaptiv motor mechanism with connecting rods;

Fig.2 is a section in accordance to the tract A-A from Fig.1;

25 Fig.3 is a section in accordance to the tract B-B from Fig.1;

Fig.4 is an axial section through the adaptiv motor mechanism with slide;

30 Fig.5 is a section in accordance to the tract C-C from Fig.4.

#### BEST MODES OF CARRYING OUT

The first mode of carrying out is represent d in Fig.1,2 and 3. This mechanism uses two pistons 1 which transmit it's alternativ motion of translation

to a connecting rod 2 using a bolt 3. The connecting rods 2 are jointed to the other end with a crank pin a which belongs to a crank shaft 4. The crank pin a is in solidarity with a crank b, having a circular forme, and which is in solidarity too with a satellite c. The satellite c engages with an interior geared plate 5, considered fixed for the same adjustment. The crank shaft 4 has too a journal d in prolongation of the satellite c. The crank b, the satellite c and the journal d have together a planetary motion inside a main shaft 6. In the same time the crank pin a is forced to have a linear motion and the main shaft 6 is forced to have a rotation motion inside a case 7. The main shaft 6 has a breach e whereby emerges that portion of the satellite c which engages with the interior geared plate 5. The radial position of the interior geared plate 5 can be changed using a geared segment f situated to the external side of the interior geared plate 5, which engages with a worm 8. The worm 8 has a axle g which is actuated by a step-by-step motor 9. The rotation motion of the step-by-step motor 9 is controlled by an electronic unit 10 which receives informations from certain specific sensors 11 and from a selector switch 12 which has many positions. The selector switch 12 transmits the option of the user. The interior geared plate 5 is hindered to have axial motion by a cover 13 fixed in the case 7.

The second mode of carrying out is represented in Fig. 4 and 5. This mechanism uses two pistons 1 solidarized by a push rod 14 which has, in the middle zone, a guide h. The ensemble made up the pistons 1 and the push rod 14 transmits its alternative motion of translation to a slide 15 which can oscilate inside the guide h and which is jointed to the crank pin a. The push rod 14 takes its alternative motion of translation as two guides 16, fixed in the case 7. The rest of this mechanism is similary with that describet in the first instance excepting th

driving of the worm 8. The axle g has a gear i, processed on it, which engages with a gear rack 17. The gear rack 17 is driven in linear motion by an actuator 18 which is controlled by the electronic unit 10.

- 5        The both variants can operate only with one piston 1, but with two pistons 1 the mechanism is more efficiently.

For the good working of these mechanisms is necessary that the distance between the center of the crank b and the crank pin a, termed L, to be equal to the pitch radius of the satellite c, termed M and equal to the pitch radius of the interior geared plate 5, termed N, diminished to one half. Therefore:

$$L = M = \frac{N}{2}$$

- 15        Other condition is that as the rotation axis of the main shaft 6 to pass through the geometrical center of interior geared plate 5.

When these mechanisms work to the maximum stroke (equal with  $2 \times N$ ) the translation axis of the crank pin a coincides with the translation axis of the pistons 1, termed X. In this position the connecting rods 2, respectively the slide 15, will have only a translation motion after axis X.

Using the worm 8 is turned with a certain angle the interior geared plate 5 what brings about the rotation with the same angle of the translation axis of the crank pin a, termed Y. The stroke of the pistons 1 is diminished after a cosine law. In this case, for the first constructive variant, the connecting rods 2, past the translation motion, will have too a swinging motion. For the second constructive variant the slide 15 will have, past the translation motion after the axis X, a translation motion after an axis which coincides with the axis of the guide g, termed Z, which is perpendicular on the axis X.

- 35        If the interior gear d plate 5 is turned with  $90^\circ$  given the situation of the maximum stroke position, in the

case of the second constructive variant, it is interrupted the motion of the pistons 1, the slide 15 oscillating only after the axis Z which coincides with the symmetrical axis of the mechanism. In this position the mechanism has the function of a coupled clutch because the stroke is equal with zero while the main shaft 6 can turn on.

#### INDUSTRIAL APPLICABILITY

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If these mechanisms are used for internal combustion engines, the specific sensors 11 transmit to the electronic unit 10 the informations about the charge of the engine, the rotation speed, the temperature of the cooling liquids, the temperature of the environment, the pressure of the air in the intake manifold, the contents of oxygen into the burned gases and about the knocking. The selector switch 12 serves for the transmission of the option of the user which can resolve a certain variant of programme memorized by the electronic unit 10, such as:

20 -The engine will furnish the maximum power for all the working loads. That means as the compression ratio will be regulated to the knocking limits for all the working loads.

25 -The engine will operate in the most economical modality. That means as the compression ratio will be regulated so as to the effective efficiency to be maximum for all the working loads.

30 -The engine will operate in the most reduced polluting modality. That means as the compression ratio will be regulated so as to the contents of harmful components to be at minimum in all the working loads.

If these mechanisms are used for hydraulic pumps the specific sensors 11 transmit to the electronic unit 10 the informations about the outlet pressure of the working oil, the rotation speed of the main shaft 6, the



inl t pressure of th working oil, tc tera.The sel ctor  
switch 12 s rv s for the transmisson of the option of  
the user which can resolve the value of the flow or th  
intterruption of the working of the pump while the dri-  
5 ving motor works on (only for the second constructiv  
variant).

The worm 8 is possible to be actuated,for simpl  
applications,using a kinematical chain directly by th  
user (without electronic unit,sensors,etcetera).

10 These mechanisms can be used for other machines if  
the pistons 1 are replaced with certain specific tools.

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## CLAIMS

1. An adaptive motor mechanism which uses a crank shaft (4) being characterized in that this crank shaft (4) includes a crank pin (a) in solidarity with a crank (b), having circular form but not obligatory, with a satellite (c) and with a journal (d), the satellite (c) engaging with an interior geared plate (5), considered fixed for the same adjustment, the satellite (c), the crank (b) and the journal (d) having together a planetary motion inside a main shaft (6) which is forced to turn inside a case (7) while the crank pin (a) has a linear motion, and in that the distance between the rotation axis of the crank (b) and the axis of the crank pin (a), termed L, is equal to the pitch radius of the satellite (c), termed M, and equal to the pitch radius of the interior geared plate (5), termed N, diminished to one half, the relation between them being  $L = M = \frac{N}{2}$ , the rotation axis of the main shaft (6) passing through the geometrical center of the interior geared plate (5).

2. The mechanism defined in the claim 1 being characterized in that the crank pin (a) is connected, in a first constructive variant, with at least one piston (1) using a connecting rod (2) and a bolt (3), the piston (1) having an alternative motion of translation.

3. The mechanism defined in the claim 1 being characterized in that the crank pin (a) has attached on it, in a second constructive variant, a slide (15) which can oscillate inside a guide (h) included in a push rod (14) which has an alternative motion of translation on at least a guide (16), fixed in the case (7), the push rod (14) being solidarized with at least one piston (1) or other working device.

4. The mechanism defined in the claim 1 being characterized in that the interior geared plate (5) can change its radial position using a geared segment (f)

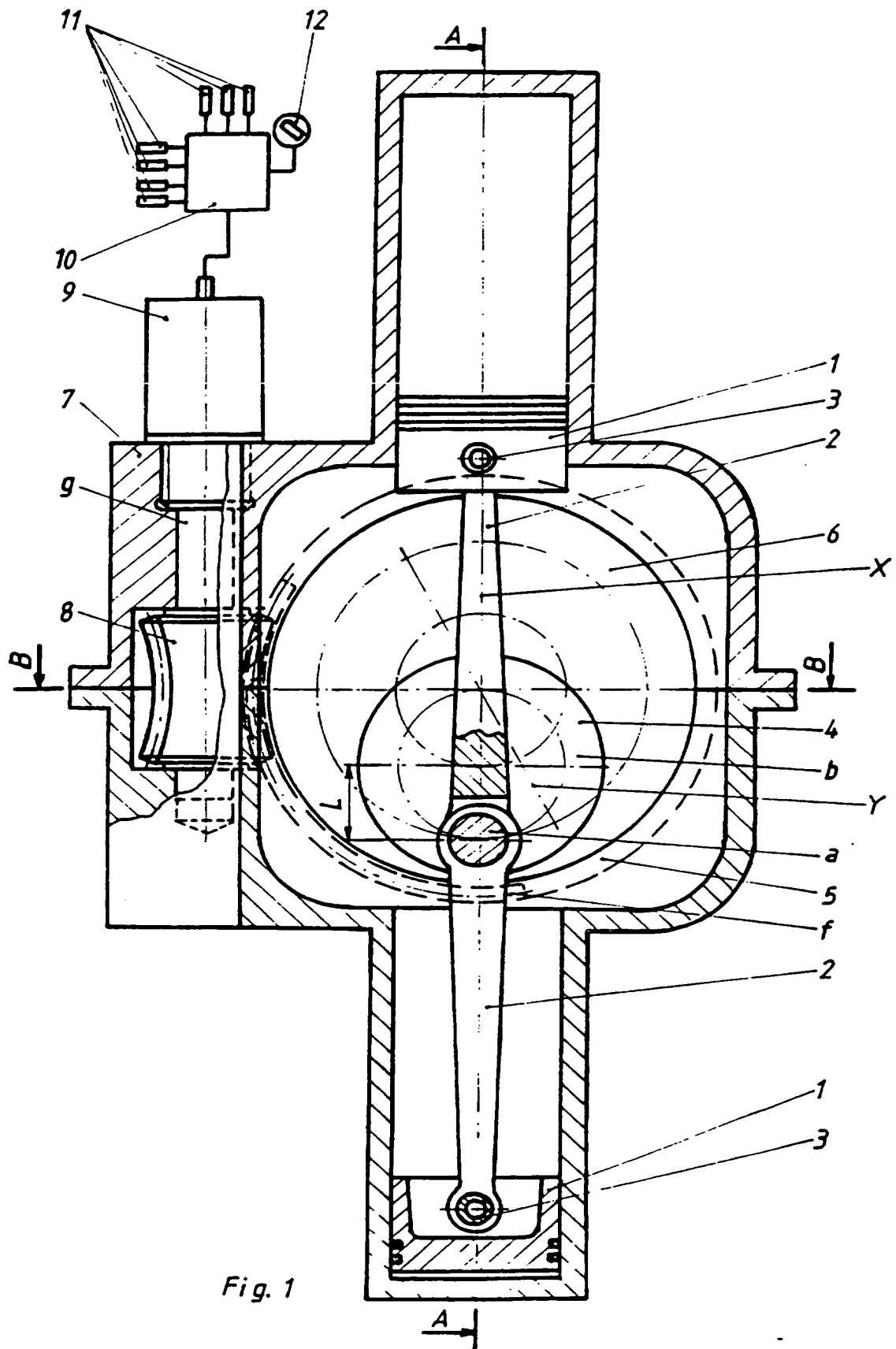
which engages with a worm (8), solidarized with a axle (g) and which can transmit a rotation motion to the interior geared plate (5).

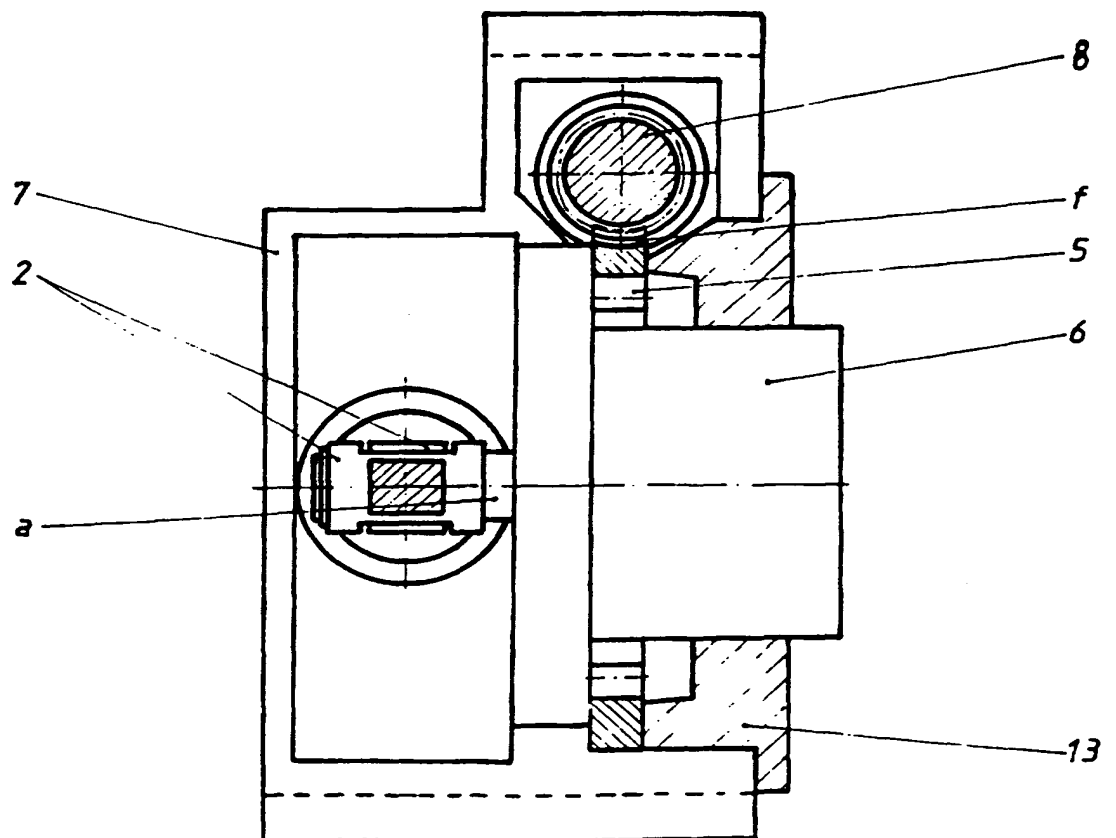
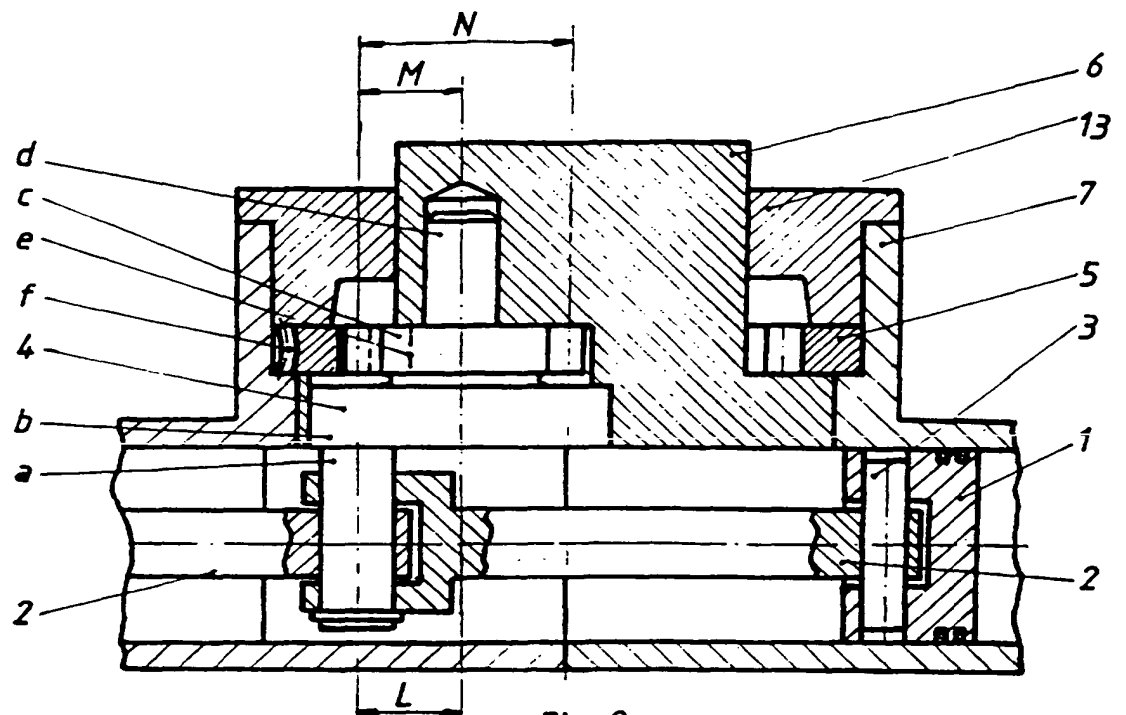
5        5.The mechanism defined in the claims 1 and 4 being characterized in that the axle (g) is driven, in a first constructive variant, by a step-by-step motor (9).

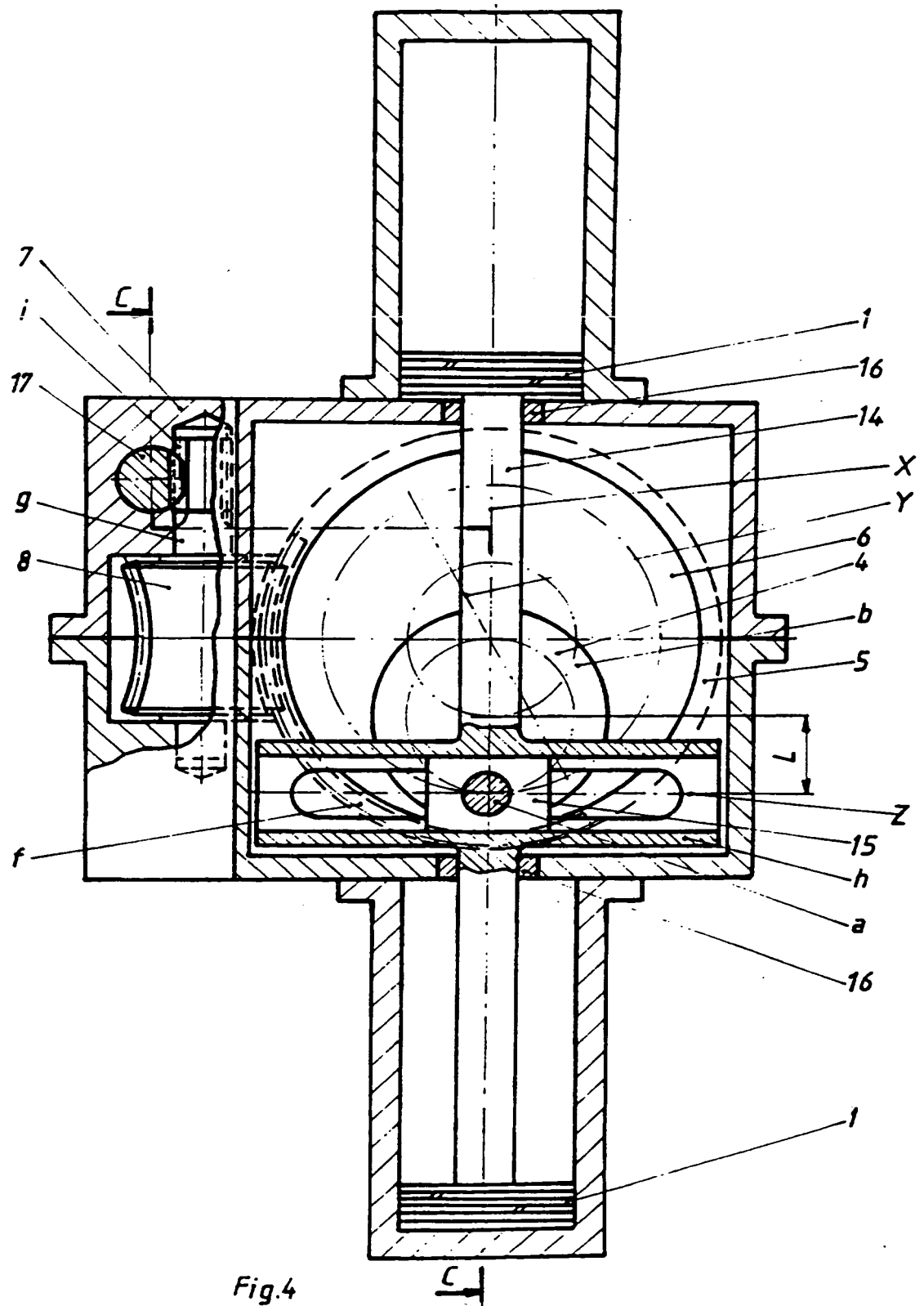
6.The mechanism defined in the claims 1 and 4 being characterized in that the axle (g) includes, in a second constructive variant, a gear (i) engaging with a gear rack 10 (17) which is driven by an actuator (18).

7.The mechanism defined the claims 1,2,3,4,5 and 6 being characterized in that the adjustment of the step-by-step motor (9) respectively of the actuator (18) is controlled by an electronic unit (10) which can decide 15 to change the radial position of the interior geared plate (5) and therefore the stroke of the piston (1), the electronic unit (10) receiving informations from certain specific sensors (11) and from a selector switch (12), with many positions, which transmits the option of the 20 user for a certain programme.

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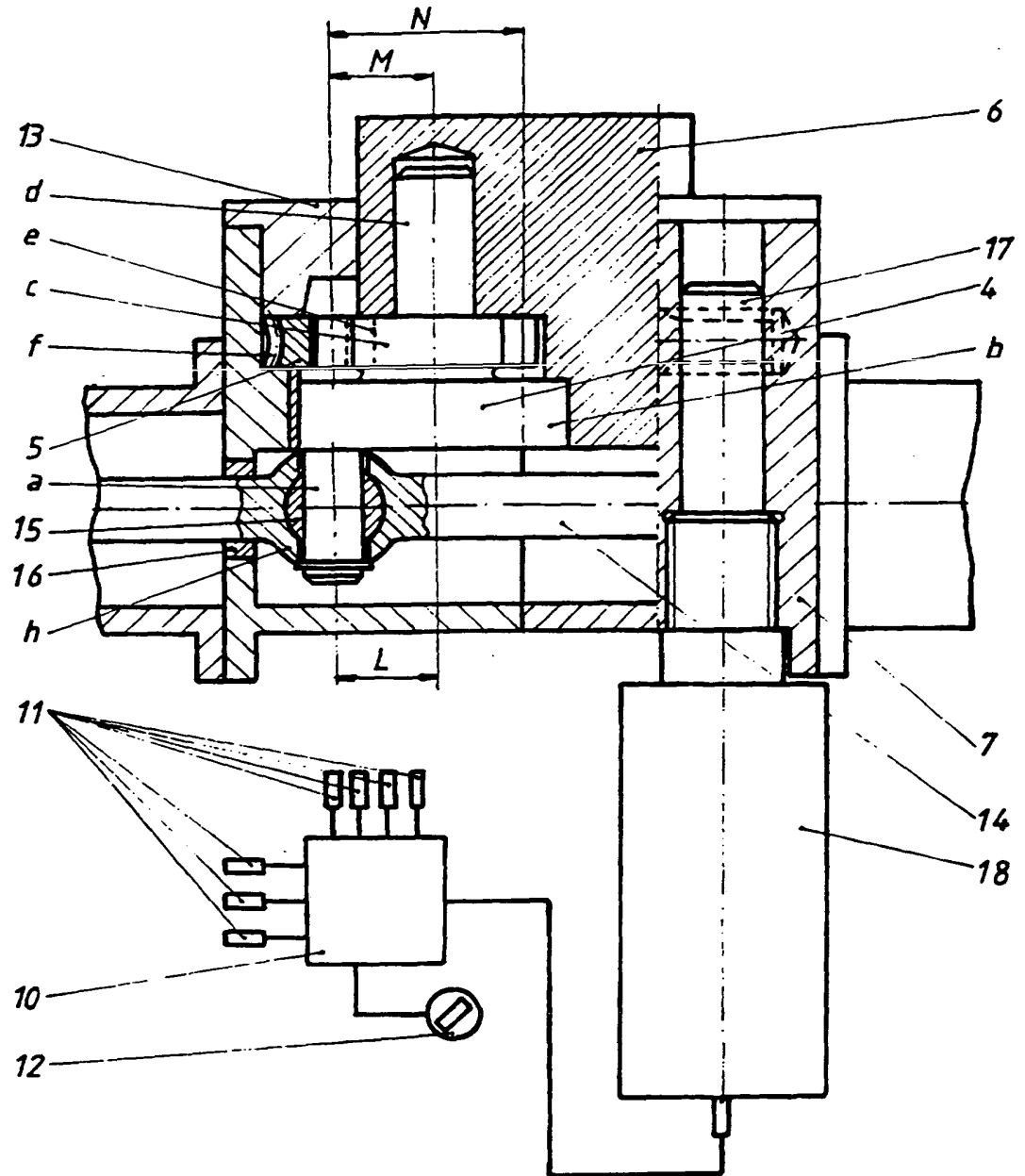


Fig. 5



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/RO 96/00002

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC<sup>6</sup>: F 01 B 9/02; F 02 B 75/32; F 16 H 25/16

According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

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IPC<sup>6</sup>: F 01 B 1/08, 7/02, 7/04, 7/06, 9/00, 9/02; F 02 B 75/24, 75/32; F 16 H 25/10, 25/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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### C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim N .
A	FR 2 680 402 A1 (BES) 19 February 1993 (19.02.93), especially fig. 1-5.	1-7
A	DE 800 264 C (MASCHINENFABRIK AUGSBURG-NÜRNBERG) 25 October 1950 (25.10.50), especially fig. 3,4.	1-7
A	GB 1 094 649 A (ROBERTS) 13 December 1967 (13.12.67), especially fig. 1,2.	1-7
A	EP 0 063 725 A2 (HILTI) 03 November 1982 (03.11.82), especially fig. 1-4.	1-7
A	FR 2 034 244 A (TOUYA) 11 December 1970 (11.12.70), especially fig. 1-6.	1-7
A	DE 34 42 608 A1 (HENIGES) 28 May 1986 (28.05.86), especially fig. 1-10.	1-7
A	DE 39 19 341 A1 (HENIGES) 21 December 1989 (21.12.89), especially fig. 1-4.	1-7
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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International application N .

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FR A1	2680402	19-02-93	keine - none - rien	
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